

Application No.: 10/674,500

Docket No.: 21029-00225-US1

AMENDMENTS TO THE SPECIFICATION*On page 1, before the first full paragraph, please insert the following sub-title:*

Field of the Invention

On page 1, before the second full paragraph, please insert the following sub-title:

Background of the Invention

On page 2, before the first full paragraph, please insert the following sub-title:

Brief Description of the Invention

On page 2, second full paragraph now reads as follows:

According to the invention, there is provided a method of rehabilitating water supply pipes comprising deploying a tubular liner within a pipe, characterized in that the liner comprises a polyolefin elastomer or a polyolefin plastomer. A polyolefin elastomer has a specific gravity density below 870 kg/m³, whereas polyolefin plastomer has a specific gravity density above 870 kg/m³.

On page 2, fourth full paragraph now reads as follows:

The polythene elastomer/plastomer preferably comprises a substantially linear ethylene interpolymer, which may comprise 50-95% by weight of ethylene, and 5-50% by weight of at least one olefinic co-monomer, preferably 10-25% by weight of the co-monomer. Co-monomers may contain from 3 to about 20 carbon atoms, and may comprise one or more of propylene, 1-butene, 1-hexene, 4-methyl-1-pentene, 1-heptene, and 1-octene. The specific gravity density range may be in the range of 830 to 967 kg/m³, preferably 863 to 913 kg/m³ and more preferably 885 to 913 kg/m³, for optimum toughness and flexibility. Preferred co-monomers are 1-hexene, and especially 1-octene.

Application No.: 10/674,500

Docket No.: 21029-00225-US1

On page 2, last full paragraph now reads as follows:

The substantially linear inter-polymers are advantageously characterized by a narrow molecular weight distribution, especially from 1,81.8 to 2,22.2 and a homogenous co-monomer distribution.

On page 3, after the fourth full paragraph, please insert the following sub-title:

Brief Description of the Drawings

On page 4, after the fourth full paragraph, please insert the following sub-title:

Detailed Description of the Invention

On page 5, please replace the paragraph from lines 23-33 with the following amended paragraph:

The liner 1410 in the preferred embodiment is a tubular extrusion of a polyolefin elastomer or plastomer. This is produced from a substantially linear ethylene inter-polymer such as described in U.S. Patents 5,272,236, US 5,278,272, and US 5,380,810. Such polymers are supplied, e.g., by DuPont Dow Elastomers S.A. ("substantially linear" means that the bulk polymer has an average of 0,010.01 to 3,03.0 long chain branches per 1000 carbon atoms, preferably from 0,010.01 to 1,01.0 long chain branches per 1000 carbon atoms). Polymers with fewer than 0.01 long chain branches per 1000 carbon atoms are described as "linear".

Last paragraph on page 5 bridging page 6 now reads as follows:

The ethylene inter-polymer preferably contains 50-95% by weight of ethylene and 5-50% by weight of at least one alpha-olefin co-monomer, preferably 10-25% by weight of co-monomer. The percentage of co-monomer is measured by infra red according to ASTM D-2238. The alpha-olefin may have up to about 20 carbon atoms, for example propylene, 1-butene, 1-hexene, 4-methyl-1pentene, 1-heptene and 1-octene are especially preferred, more especially 1-octene for use in the liner. The thus produced inter-polymers are eharaeterisedcharacterized by a narrow molecular weight distribution and by a homogenous co-monomer distribution. The molecular weight distribution (Mw/Mn) measured by GPC (Gel Permeation Chromatography) is defined by

Application No.: 10/674,500

Docket No.: 21029-00225-US1

the equation $M_w/M_n (I_{10}/I_2) = 4,634.63$. The preferred specific gravity density range of the interpolymer is from 863 to 913 kg/m³ because the liner is flexible and yet has an excellent burst strength due to tie chain molecules.

On page 6, please replace the sentence on line 21 with the following amended sentence:
specific gravity density g/cm³ 0.908 ASTM D-792

On page 7, please replace the sentence on line 10 with the following amended sentence:
specific gravity density (g/cm³), ASTM D-792 0.864-0.9130.864-0.913

On page 7, please replace the sentence on line 16 with the following amended sentence:
Melt Index, 12, ASTM D-1238, dg/min 0.5-300.5-30

On page 7, second full paragraph from the bottom now reads as follows:
The specific gravity density of the preferred material is in the range of 902 to 908 kg/m³, tensile strength from 32-33 Mpa, and ultimate elongation up to 800 %.

Last paragraph on page 7 bridging page 8 now reads as follows:
The liner 10 is extruded by using a vacuum calibration die to produce a profile with a wall thickness from 0.25-0.550.25-0.55 mm and to fit lead water pipes of 0.50.5 inch and 0.750.75 inch (12.512.5 and 20 mm) internal diameter. It is also designed to expand radially under pressure ~~whilst~~while retaining its structural and geometrical integrity and be able to recover its shape even after the collapse under vacuum. The liner is die drawn during extrusion ~~whilst~~while the material is just below the ~~erystallisation~~crystallization melt temperature. This enables the liner to be reduced significantly in size (e.g. from 12 to 6-8mm) and also produces significant orientation of the polymer in the axial direction of extrusion. The form of the reduced die drawn liner is shown in Figure 3, which is a cross section of the liner 10 showing that the pleats are drawn in-together until their inner surfaces ~~about~~but. This figure is not to the same scale as Figures 1 and 2 and the shrunken liner of Figure 3 is of much lesser diameter than the liner 10 of Figure 1.

Application No.: 10/674,500

Docket No.: 21029-00225-US1

Last paragraph on page 8 bridging page 9 now reads as follows:

When installing the lining, the pipe 1211 is thoroughlythoroughly cleaned by a suitable cleaning method, for example by pumping clean water through the pipe by means of a portable water container fitted with a pressurisedpressurized pump attachment. This method has been shown to be useful in washing out deposits such as oxides which can accumulate in the lead pipe, from the iron water mains. The water also acts as a suitable lubricant for insertion of the liner-; other methods of cleaning such as blowing cleaning sand through the pipeline, or by use of cleaning rods with appropriate attachments may be used. Access is gained to the pipe by way of a stop cock or chamber boundary box. A pig may then be blown through the pipe 11 with a line attached to be used as a leader for pulling the liner 10 through the pipe for up to 30 metresmeters or more. Alternatively, a flexible rod may be attached to the liner for moving the liner into the pipe. When the liner is in place, the pipe is reconnected. Pressure of water in the pipe during use will expand and retain the liner in place, and the liner will prevent contamination of the water by the metal of the pipe. The liner 10 is made of a selected grade of polyolefin elastomer or plastomer, with a wall thickness of between 260-500 or more microns, or sufficient to maintain the liner's geometric integrity within an existing underground host pipe without collapse.